Answer on Question # 57293 – Physics – Molecular Physics | Thermodynamics

A person with external body temperature 35°C is present in a room at temperature 25°C. Assuming the emissivity of the body of the person to be 0,5 and surface area of the body of the person as 2,0 m^2, calculate the radiant power of the person.

Solution:

The radiant power of the body can be found from the following equation:

$$P = A_\gamma \sigma \cdot (T_b^4 - T_r^4) \cdot S = 0{,}5 \cdot 5{,}67 \cdot 10^{-8} \cdot (308{,}15^4 - 298{,}15^4) \cdot 2 = 63{,}2 \left[W \right],$$

where $A_\gamma = 0{,}5$ is the emissivity of the person's body;

$\sigma = 5{,}67 \cdot 10^{-8} \left[\frac{W}{m^2 \cdot K^4} \right]$ is the Stefan-Boltzmann constant;

$T_b = 35 + 273{,}15 = 308{,}15 \left[K \right]$ is the absolute external temperature of the human's body;

$T_r = 25 + 273{,}15 = 298{,}15 \left[K \right]$ is the absolute temperature in the room;

$S = 2 \left[m^2 \right]$ is the surface area of the body.

Answer: 63,2 W.